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THE CODLING MOTH, AND HOW IT MAY BE CONTROLLED.

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"Wormy" apples are usually the principle item of loss to the apple grower. The larvae of the codling moth are responsible for by far the greater part of this damage. This loss may be largely avoided by the proper use of arsenical poisons in the form of a spray. The yearly loss to the apple growers from this pest throughout the United States is very large. Doctor Forbes estimates that for Illinois this amounts to \$2,375,000 each year, and according to Professor Slingerland, the annual loss in New York State is approximately \$3,000,000. While many of the apple growers in Maryland regularly spray for this insect, there are also many who do not, and the increasing interest manifested in apple culture and the consequent planting of apple orchards, is reason for believing that injury from this pest will become increasingly noticeable in the future, unless efforts are made to keep it under control. The present circular has been prepared with the idea of furnishing the necessary information to secure the greatest amount of freedom from injury.

Summary of Life History of the Codling Moth.

The insect is shown in various stages in Figure 1. The apple is cut to show the work of the larva within the fruit. The larva is shown at e, the pupa at d, and the cocoon at i. The moth, or adult, is illustrated at g and f; all approximately natural size.

The adult, or moth, appears in the spring as the blossoms are falling from the apple trees, and in the course of a few days begins to deposit its small scale-like eggs on the skin of the young apples or on adjacent leaves and twigs. From these eggs in the course of about a week, the tiny larvae make their escape, the majority finding their way in a short while into the blossom end of the apples. Here the larva feeds around the calyx cavity for several days before boring its way to the inside. About three weeks is spent by a larva feeding within the apple, by which time it has nearly reached its growth. It prepares to leave the apple by making an exit tunnel to the outside, as shown in

Figure 1. The opening to the exterior, however, is kept sealed over until the larva is quite ready to depart. After leaving the apple, in case the apple is still hanging to the tree, it makes its way to the trunk and larger limbs, or to the ground, where, in the crevices of the bark or under trash, a small, silken cocoon is spun, and the pupa stage is entered. In about two weeks after entering the pupa stage, the moth appears, thus completing the life cycle of the insect. Eggs are soon laid for a second brood of worms. Larvae of the second and successive broods do not as a rule enter the fruit at the blossom end, but mostly at the side, particularly where the fruits are in contact. From observations recently made by Sanderson in Delaware, it would seem that in this latitude, part of the caterpillars of the second brood remain as such over winter, hibernating in their cocoons, while others transform to pupae, and later, moths, giving rise to a third brood of larvae, which

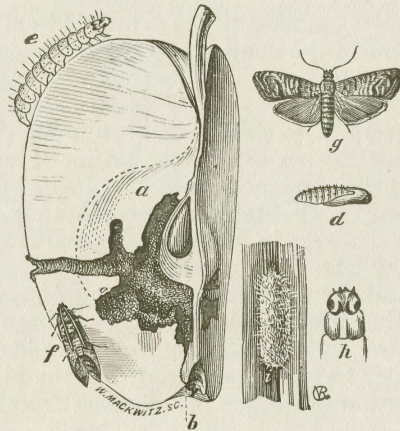


Figure 1—The Codling Moth, after Riley.

hibernate over winter. We thus have two full broods, and a good-sized third brood. The second, and more particularly the third brood, may do serious damage by mining beneath the skin of the apples around the calyx cavity, thus disfiguring them and opening a way for more serious injury from rot.

The essential points to be kept in mind in the foregoing statement of the life history of the insect are that the larvae of the first brood in the spring enter the young apples at the blossom end, where they feed in the calyx cavity for several days before eating into the interior, and that the larvae of the second and third broods largely enter the fruit at the side. It should also be noted that the larvae in pupating, seek protected places along the trunk and limbs, as well as under trash on the ground, where they may spin their cocoons. These points in the life history of the species furnish a basis for its control.

How the Insect May be Controlled.

First, Spraying.—Extended observation has shown that approximately seventy-five per cent. of the larvae of the first brood of the codling moth enter the fruits at the blossom end, where they feed around in the calyx cavity for some days. It is therefore apparent that if a small quantity of poison can be lodged in the calyx cavity, the little larva will be destroyed in eating its first meal. Many experiments in various parts of the United States show conclusively that if trees are thoroughly sprayed with an arsenite, as Paris green or green arsenoid, just after the blossoms have fallen, or within ten days thereafter, a large percentage of the young apples can be sufficiently poi-



Figure 2.—Two Apple Clusters; on the left, just right to spray; on the right, too late to spray effectively.

soned to cause the death of the larvae before they have had time to injure the apple. The spraying, however, must be done thoroughly, and should be done within ten days after the petals have fallen. The reason for this latter requirement will be apparent by reference to Figure 2. The left hand figure shows an apple fruit cluster, from which the bloom has just fallen. It will be noticed that the calyx lobes are still spread, and that the cavity is open and cup-like. These young fruits are in the right condition to spray. The figure on the right illustrates a fruit cluster about twelve days after the petals have fallen. It will be noticed that the calyx lobes have now drawn together, protecting the

calyx cavities to such an extent that but very little poison could be lodged in the blossom end of the fruit by spraying at this time. This illustration will indicate why the work should be done within the time specified. Where possible, it is advisable to make two applications of the poison before the calyx lobes have drawn together. If one treatment be given as soon as the petals fall, followed by another within a week, the probabilities of thorough work will be greatly increased. A second treatment is particularly desirable if a heavy rain occurs soon after the first application has been made, and before the calyx lobes have drawn together. The almost universal use of Bordeaux mixture by apple growers to protect the trees, leaves and fruit from blights and scab, furnishes good opportunity for the use of Paris green or green arsenoid against the codling moth, without extra trouble, as these poisons may be applied just as advantageously in Bordeaux mixture as in water, and should be used in exactly the same proportion, namely, at the rate of one pound of the poison to one hundred and fifty gallons of water or Bordeaux. In spraying, the work should be done from above as much as possible, as the young fruits are standing upright, and in this way the work will be more effective.

Second, the Use of Bands.—Spraying will not be effective in controlling the second and third brood, as already shown, and most relief will come from the use of bands of burlap wrapped around the trunk and larger limbs. Very many of the larvae, in seeking a sheltered place in which to pupate will find their way to these bands. This furnishes a means of readily collecting and destroying them in considerable quantities. The bands should be placed around the trees at least by the first of June, and should be examined at intervals of a week, particularly during late June and early July, destroying all of the pupae found. Very many pupae also occur in loose bark along the trunk and limbs, and it will be advantageous to thoroughly scrape these parts of the tree in order to concentrate pupation in the burlap bandages.

Many apples infested with the codling moth fall to the ground about the time the larva is full grown. These should be kept collected from the ground as they fall, and fed to swine, or otherwise disposed of. If this matter is not attended to promptly after the fruit falls, the larvae will leave the apples, and pupate in the trash on the ground. If proper attention is paid to thoroughly spraying to destroy the first brood, to the use of bandages on the larger limbs and trunks to trap the pupae of the second and third broods, and if the "wormy" apples are kept carefully collected from the ground, injury from this insect will be reduced to the minimum.